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ADMINISTRATIVE REPORT H-88-19

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PREFACE

This report focuses on the American Samoa foreign longline fishery during 1982-86. Data collection was done by Fishery Biologist Gordon S. Yamasaki, formerly of the Honolulu Laboratory and now with the Southwest Region of the National Marine Fisheries Service, NOAA. The longliner landings, fishing operations, and tuna length-frequency data sets were summarized by programs created or modified by Computer Programmers Richard I. Uyeda and Ann C. Todoki, Honolulu Laboratory. Confidential data are excluded from this report.

Southwest Fisheries Center Administrative Report H-88-19

STATUS OF THE AMERICAN SAMOA FOREIGN LONGLINE TUNA FISHERY, 1982-86

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NOT FOR PUBLICATION

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INTRODUCTION

American Samoa is a center for a far-ranging foreign longline tuna fishery. The first tuna cannery (Van Camp Seafood Company) in American Samoa was built in Pago Pago in 1949, but except for two trial runs, the cannery was not operated until seven Japanese longline vessels off-loaded their catch at the cannery in 1954 (Van Campen 1954). A second cannery (Star-Kist Samoa Inc.) began operating in mid-1963 (Otsu and Sumida 1968). The foreign tuna longline fishery and production by the two canneries grew steadily during the two decades after 1954. During that time, canneries relied heavily on tuna caught and off-loaded by foreign tuna longliners (Otsu and Sumida 1968; Yoshida 1975). Foreign tuna longliners still contribute substantial amounts of tuna off-loaded at the canneries, despite the introduction of U.S. purse seiners to the central and western Pacific Ocean in the early 1970's and the seiners' increased activity in the 1980's. The recent and rapid expansion of the South Pacific troll fishery for albacore, *Thunnus alalunga*, and the increased interest of longliners towards fresh-frozen fish (sashimi) may have some effect on the number of vessels fishing for tuna destined for canning. These and other factors make it important to monitor the foreign longliners off-loading tuna in American Samoa.

Information on the foreign longline tuna fishery off-loading in American Samoa has been presented for 1954-65 by Otsu and Sumida (1968), for 1966-71 by Yoshida (1975), and for 1972-81 by Ito and Yamasaki (in prep.). The present report summarizes information from the foreign longline tuna fishery in American Samoa during 1982-86. The 5-year period was chosen as a basis for comparison with current quarterly and annual reports to be released on as timely a basis as possible.

MATERIALS AND METHODS

Data Collection

A port sampling program was initiated in American Samoa in 1963 when the Bureau of Commercial Fisheries (now the Southwest Fisheries Center Honolulu Laboratory of the National Marine Fisheries Service (NMFS), NOAA) in Honolulu began collecting data on catches off-loaded in American Samoa. The three data sources were cannery reports, vessel operators or their logbooks, and samples of albacore off-loaded in American Samoa. Data collection was taken over in 1971 by the Office of Marine and Wildlife Resources, Government of American Samoa, under contract. In 1984-87, the port sampling program was operated by personnel from the NMFS Honolulu Laboratory, then was transferred to the NMFS Southwest Region as part of the implementation of the Treaty on Fisheries between the governments of certain Pacific island states and the United States.

The data supplied by the two canneries (Samoa Packing Co. and Samoa Star-Kist Inc.) on catches off-loaded in American Samoa include weight and species of fish off-loaded by each vessel. Summaries of landings are estimates of total landings, species composition of the catch, and estimates of average catch per trip. Because these data are confidential, the total

landings (in metric tons) are scaled estimates, as is the average catch (in metric tons) per trip. The estimates of total landings represent all species of fish off-loaded by longliners, including fish species processed at the canneries or sold as fresh-frozen fish. Recorded weights may be affected by on-board processing of fish prior to weighing. For example, all albacore and skipjack tuna, *Katsuwonus pelamis*, are delivered to the canneries in the round, whereas large yellowfin tuna, *T. albacares*, and large bigeye tuna, *T. obesus*, are usually gilled and gutted, and billfishes are usually headed, gilled, and gutted. The billfish category includes the swordfish *Xiphias gladius* and the marlins (e.g., striped marlin, *Tetrapturus audax*; blue marlin, *Makaira mazara*; black marlin, *M. indica*; shortbill spearfish, *Tetrapturus angustirostris*; and sailfish, *Istiophorus platypterus*)). The "other" category included skipjack tuna, wahoo (ono), *Acanthocybium solandri*, and large bigeye tuna. Skipjack tuna and wahoo are processed by the canneries. Fish species that contributed little to total landings are excluded from species composition. Also recorded are oilfish, *Ruvettus pretiosus*; gastoro, *Gasterochisma melampus*; and moro (sharks). Other miscellaneous fish species are sold as fresh fish or fresh-frozen fish, either transshipped elsewhere or made into fish meal. Mahimahi, *Coryphaena hippurus*, are usually bartered and are not recorded by the canneries in their landing reports. Wahoo is sometimes bartered also. The landing reports are also the source for the number of vessels, trip activity, and number of off-loadings by sashimi vessels of the foreign longline fleet.

Vessels categorized as "sashimi" longliners are separated from the cannery longliners because the sashimi vessels differ from the typical cannery longliner by targeting large bigeye tuna, large yellowfin tuna, and marlins. Sashimi vessels are larger (usually >350 gross registered tons (GRT)), and fishing gear is modified. Most of the sashimi vessel catch is transshipped from American Samoa to be sold elsewhere as fresh-frozen fish, which demand a higher unit price than albacore but require more care in handling of the catch. The albacore, small yellowfin tuna, and other catches from sashimi vessels are off-loaded at the canneries. Although the number of off-loadings made by sashimi vessels has increased during the 1980's (Fig. 1), the catches off-loaded to the canneries are so small (<2% of total catches off-loaded from all longliners) that they are excluded from further analysis.

Data on the fishing operations of the foreign longliners are collected from the vessel operators or transcribed from logbooks. The data on the fishing operations are summarized by vessel size class (excludes sashimi vessels), average number of days fished, fishing effort (in number of hooks set), geographic range of the fishery, annual catch per unit effort (CPUE; number of fish caught per 100 hooks), and quarterly CPUE by area fished. Although most (55-80%) of the foreign longliners participate in the logbook program, some adjustment in the fishing effort estimate, based on cannery data, is necessary to account for those vessels not in the program. Catch per 100 hooks is presented in annual CPUE. Some factors possibly affecting catch rates are shark-eaten and whale-eaten albacore. Any partially eaten fish recorded in the logbooks are included in the catch rates. Annual CPUE is not calculated for some minor species because they have not always been recorded by the longliners. Geographic and seasonal distribution of CPUE

are presented in quarterly maps. The CPUE is centered in 10° squares to give an idea of catch rates in general areas of the South Pacific. Geographic and seasonal distribution of albacore CPUE was generated by Fuqua and Todoki (1987) and mapped by the Hawaiian Islands Mapping Program (Fuqua 1987). Data on geographic areas fished by the longliners are summarized by 5° squares. Geographic distribution of CPUE and geographic areas fished do not reflect exact locations or intensity of fishing effort. The map area covers the Pacific area from lat. 50°S to 50°N and from long. 130°E to 100°W. The total surface area covered by the map is approximately 1.1 billion km^2, of which about 90% is ocean.

Also as part of the port sampling program in American Samoa, 50 albacore per vessel are randomly measured from longliners off-loading at the canneries. Samples are taken on the fishing vessels after the fish are manually removed from the fishholds or from the fish boxes off-loaded at the cannery dock. Fish are measured for fork length (to the nearest millimeter) with a 1.5 m caliper. Beginning in 1984, yellowfin, bigeye, and skipjack tunas (N = <25 fish per species) also have been included in the sampling. Number and species of fish sampled are dependent upon the types of fish present, time available, and safety-related factors. Some selectivity is unavoidable when broken, damaged, or misshapen fish are encountered. Off-loading procedures also contribute to some selectivity because crew members sort fish by size and species for each fishhold on the vessels. The sampling methodology attempts to take these problems into account. Information on area of origin for length-sampled albacore is general and cannot be confirmed because vessels travel to different fishing areas when catch rates are low, commonly covering large areas during a single trip. Therefore, areas of origin for fish sampled are estimates. The data summaries in the present report may not correspond exactly with other previously published reports because the computer programs generating the summaries use several assumptions to simplify computations.

RESULTS AND DISCUSSION

Vessels

There has been a downward trend in the number of vessels participating in the longline fishery from 1980 to 1985, when only 87 vessels participated in the fishery (Fig. 2). However, the number of vessels increased somewhat in 1986 to a total of 110 vessels. Since the fishery began in 1954, the lowest number of vessels off-loading in American Samoa occurred in 1954 (N = 15 vessels), and the highest number occurred in 1973 (N = 336 vessels). Size classes of longliners ranged from about 80 to 354 GRT; most vessels were in the 151-250 GRT (Table 1). Within the 5-year period (1982-86), the number of larger (>350 GRT) vessels gradually increased. The larger vessels are either new or have been refitted to participate in the longline fishery.

The composition of the fishing fleet in terms of nationality did not change much in 1982-86: All of the vessels were either Korean or Taiwanese, except one Tongan vessel which fished in 1984-86 and a very

small Samoan-owned vessel which fished in 1982-86. Some Korean and Taiwanese vessels have also concentrated on the sashimi longline fishery. The composition has changed dramatically since 1954-57, when the longline fleet was composed exclusively of Japanese vessels. The number of Japanese longliners increased until the mid-1960's, then fell rapidly during the rest of the decade, and none were left in the fishery by the early 1970's. Korean vessels began fishing in 1958 and Taiwanese vessels in 1964, displacing the Japanese vessels in the foreign albacore longline fleet.

Trips

A total of 274 trips were made in 1982 (Fig. 3). The number of trips fell to a low of 175 in 1985, then increased to 210 in 1986. Korean vessels made a high of 180 trips in 1982 and dropped to 65-99 trips during the following 4 years. The Taiwanese longline fleet fluctuated between 70 and 113 trips during the 5-year period. In general, a greater number of trips were concluded during the first and third quarters of each year. The annual average number of days fished per trip rose from 84 days in 1982 to 103 days in 1984 then decreased to 82 days in 1986 (Fig. 4). The highest mean number of days fished per trip occurred during the years with fewer longliners in the fleet. Fishing trip length can also be influenced by vessel size because larger vessels make longer trips.

Effort

Average fishing effort per trip increased with the entrance of larger vessels which make longer trips and set more hooks per day. The estimated number of hooks set annually was at its highest level in 1982--about 52 million hooks (Fig. 5). Effort dropped to a low of 39 million hooks in 1984, increased to 42 million hooks in 1985, and dropped somewhat in 1986. Generally, more hooks per trip were set by Korean vessels than by Taiwanese vessels of comparable vessel size class.

Landings

Estimated total landings were slightly over 20,000 metric tons (t) in 1982 and 1983, then decreased to 16,600 t in 1984. Landings increased for the next 2 years, up to 23,500 t in 1986 (Fig. 6). More fish were landed by Korean vessels. The highest percentage of catch off-loaded usually occurred in the first and third quarters of the year, whereas the lowest percentage of landings occurred during the second quarter (Table 2).

The typical longliner off-loading in American Samoa selectively fishes for albacore which yield a higher unit price than do other tuna species at the canneries. Interviews with a few vessel captains indicated that some vessels discarded or consumed other species of fish to conserve space for albacore aboard their vessel. Therefore, only albacore catches were off-loaded in their entirety at the canneries, as reflected by the species composition of the total catch off-loaded (Fig. 7). Albacore ranged from

56.6% in 1984 to 76.5% in 1986. The highest percentages of off-loaded albacore occurred in the first and third quarters. Second highest in species composition of catch off-loaded was yellowfin tuna which ranged from 10.4% in 1986 to 20.4% in 1984. The highest percentages of yellowfin tuna occurred in the second and fourth quarters of the year. Bigeye tuna ranged from 3.9% in 1986 to 10.4% in 1983; billfish ranged from 5.7% in 1986 to 9.2% in 1985; skipjack tuna, wahoo, and large bigeye tuna combined ranged from 3.1% in 1986 to 4.7% in 1984.

The estimated average landings per trip increased with vessel size class, and average landings for each vessel size class increased in 1982-86, with the exception of the <100 GRT size class which was being phased out of the fishery (Table 3). Mean average landings per trip for all vessel size classes combined increased from 75 t per trip in 1982 to 112 t per trip in 1986. This increase was probably a result of the larger vessels entering the fishery.

Geographic Range of the Fishery

At the outset of the fishery, the longline tuna fishing area was small and localized but expanded rapidly during the 1950's and 1960's (Otsu and Sumida 1968; Yoshida 1975). By 1971, much of the South Pacific was fished by the longline fleet based in American Samoa (Skillman 1975). Area fished by longliners extended into the North Pacific during 1982-86. Latitudinally, the longliners fished between 45°S and 45°N. Fishing in the Southern Hemisphere covered a greater area compared with the Northern Hemisphere where fishing occurred mainly in the central area above the Hawaiian Islands (Fig. 8). The first, second, and third quarters were similar in area fished, except more area was covered in the southwestern Pacific during the second and third quarters (Fig. 9A-C). Fishing extended far into the North Pacific in the fourth quarter (Fig. 9D).

Catch Per Unit Effort

During quarters in which albacore CPUE decreased, CPUE for yellowfin and bigeye tunas rose slightly, compensating somewhat for the depressed albacore CPUE (Fig. 10). The best CPUE for albacore occurred in the third quarter. Over the 5-year period, annual albacore CPUE increased from 1.65 fish per 100 hooks in 1983 and 1984 to 3.24 fish per 100 hooks in 1986, but was below the CPUE of the 1960's (from about 3.3 fish per 100 hooks in 1971 to about 5.0 per 100 hooks in 1963) (Yoshida 1975). Yellowfin and bigeye tuna CPUE was very low in comparison to CPUE of albacore. Yellowfin tuna CPUE ranged from 0.21 in 1986 to 0.47 in 1984, whereas bigeye tuna CPUE ranged from 0.11 in 1986 to 0.29 in 1983.

The areas in the Southern Hemisphere with the highest CPUE were concentrated between lat. 20° and 40°S during the second and third quarters. Some vessels ventured north of the Hawaiian Islands and experienced high CPUE. Those trips usually occurred in the first and fourth quarters (Figs. 11-15).

Size of Albacore

Most of the albacore sampled were 80.0-100.0 cm fork length. Larger fish were abundant during the first quarter and smaller fish during the third quarter, but there was little change in size of albacore throughout the year, as evidenced in the quarterly length-frequency histograms (Figs. 16-20). The annual mean size of albacore did not change much and ranged from 90.6 cm in 1983 to 92.6 cm in 1985. With the exception of the third quarters, the length-frequency histograms appear to be skewed towards larger fish.

SUMMARY

Landings by the longline fleet have been surpassed by the purse seine fleet in American Samoa (Schug and Galea'i 1987); however, longliners are still the principal suppliers of albacore, the premium-priced white meat canned tuna. A summary of the evidence presented in this report includes the following key points:

1. The nationality of the foreign longline fleet is made up of Korean and Taiwanese vessels.

2. Larger vessels are beginning to enter the fishery, but most of the vessels remained in the 151-250 GRT size range.

3. The number of sashimi vessels unloading partial catches have increased but contribute little to the total landings of the albacore longline fleet.

4. Effort dropped to a low in 1984 and was stable in 1985 and 1986. Korean vessels set more hooks per trip than did Taiwanese vessels of a comparable vessel size class.

5. Albacore made up most of the landings, ranging from 56.6 to 76.5% of the landings.

6. The American Samoa foreign albacore longline fishery covered areas in both the North and South Pacific; most of the activity concentrated in the South Pacific. Fishing in the North Pacific occurred mostly in the first and fourth quarters of the year and extended above the Hawaiian Islands.

7. The CPUE fluctuated throughout the year; CPUE for albacore was highest in the third quarter of the year. The CPUE increased since 1984 but was below the CPUE of the 1960's and early 1970's.

8. Geographic distribution of CPUE was highest between lat. 20° and 40°S. Fishing was concentrated in the Southern Hemisphere during the second and third quarters, whereas some fishing occurred during the first and fourth quarters.

9. Larger fish were more prominent in the first quarter, and smaller fish were landed more frequently in the third quarter. For the longliners in American Samoa, 1984 had the least amount of vessels, trips, effort, and landings in the 5-year period. During that same year, the percent of albacore landed, in relation to total catch, and CPUE were at their lowest.

The level of activity by the foreign longline albacore fishery underwent some changes that should affect the fleet for years to come. The 5-year period covered in this report is a good reference to the current status in comparison to upcoming years. Judging from the long-term trends in the longline fishery and tuna industry in American Samoa, we expect the foreign longline fishery to continue to be important in supplying much of the albacore to the canneries.

ACKNOWLEDGMENTS

We are grateful for the cooperation received from the Government of American Samoa, the tuna canneries Starkist Samoa Inc. and Samoa Packing Co., and the longline vessel operators. At the Honolulu laboratory we would like to thank Ray S. Sumida for his valuable input and his supervision of the data processing, Data Management and Technical Services for data input and editing, and the editorial staff for the preparation of this manuscript. We would like also to thank Samuel G. Pooley, Jerry A. Wetherall, and Marian Y. Y. Yong for reviewing this paper.

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Table 1.--Number of vessels by gross registered tons (GRT), 1982-86.

Year	No. of vessels by GRT					
	<100	100-150	151-250	251-350	>350	Unknown
1982	2	46	155	40	4	27
1983	1	28	114	45	5	12
1984	0	26	102	31	4	19
1985	0	22	94	42	9	8
1986	0	24	123	43	7	13

Table 2.--Percent landings per quarter, 1982-86.

Year	Landings (%) per quarter			
	1	2	3	4
1982	29.9	20.0	30.0	20.1
1983	25.7	17.8	30.6	25.9
1984	30.7	15.1	30.6	23.6
1985	21.1	16.6	42.6	19.7
1986	22.4	23.2	35.4	19.0
Mean	25.8	18.9	33.8	21.5

Table 3.--Estimated mean catch (in metric tons (t)) per trip by vessel size class (in gross registered tons (GRT)), 1982-86.

Year	Mean catch (t)/trip by vessel size (GRT)					
	<100	100-150	151-250	251-350	>350	Mean
1982	70	60	80	110	120	75
1983	70	90	110	120	170	99
1984	--	70	90	140	150	91
1985	--	90	110	140	130	109
1986	--	100	110	160	170	112

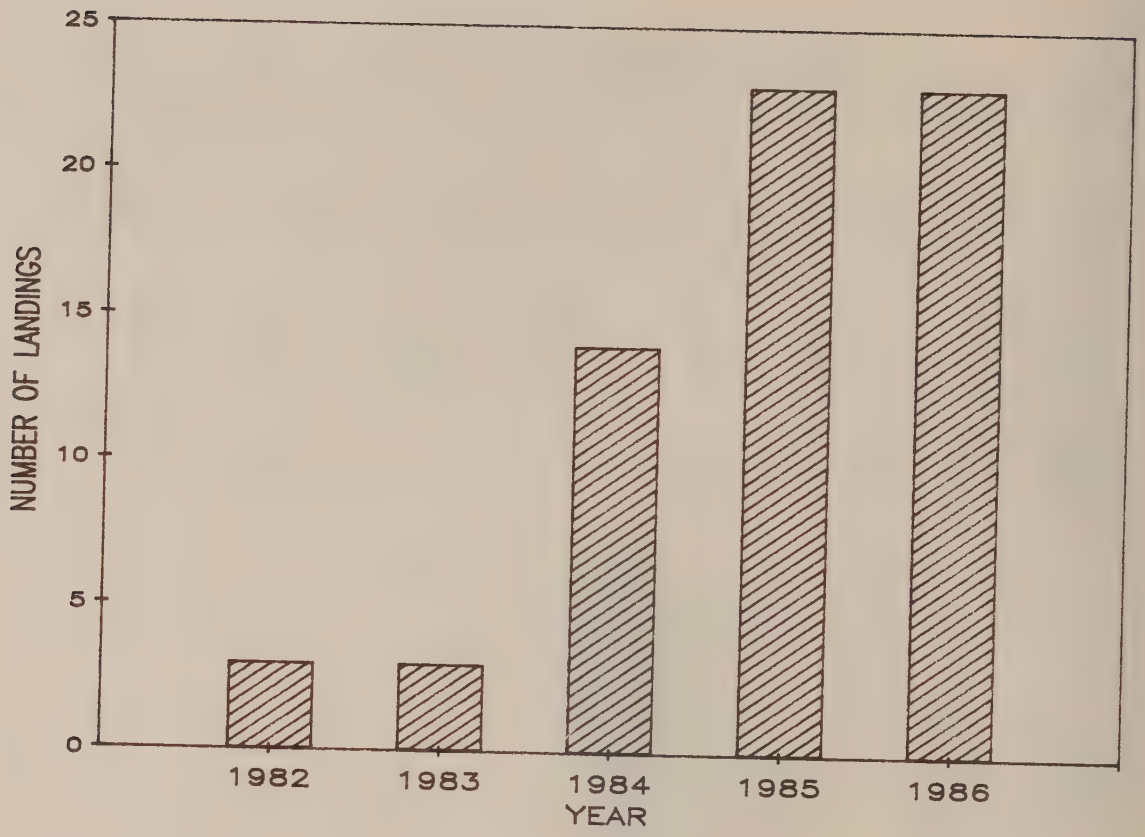

Figure 1.--Number of sashimi vessel landings in American Samoa, 1982-86.

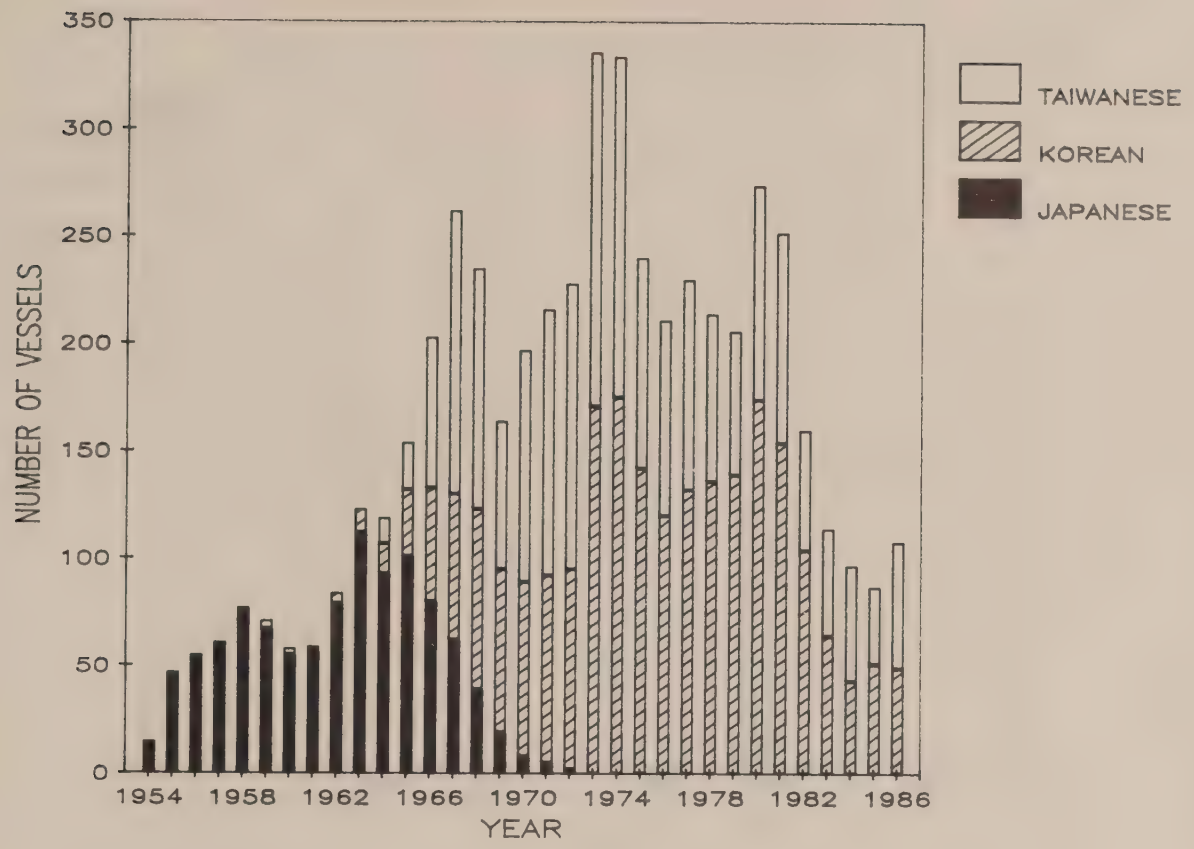

Figure 2.--Number of Japanese, Korean, and Taiwanese vessels off-loading in American Samoa, 1954-86. Note: Does not include one Tongan vessel longline fishing in 1984-86 and one Samoan-owned vessel fishing in 1982-86.

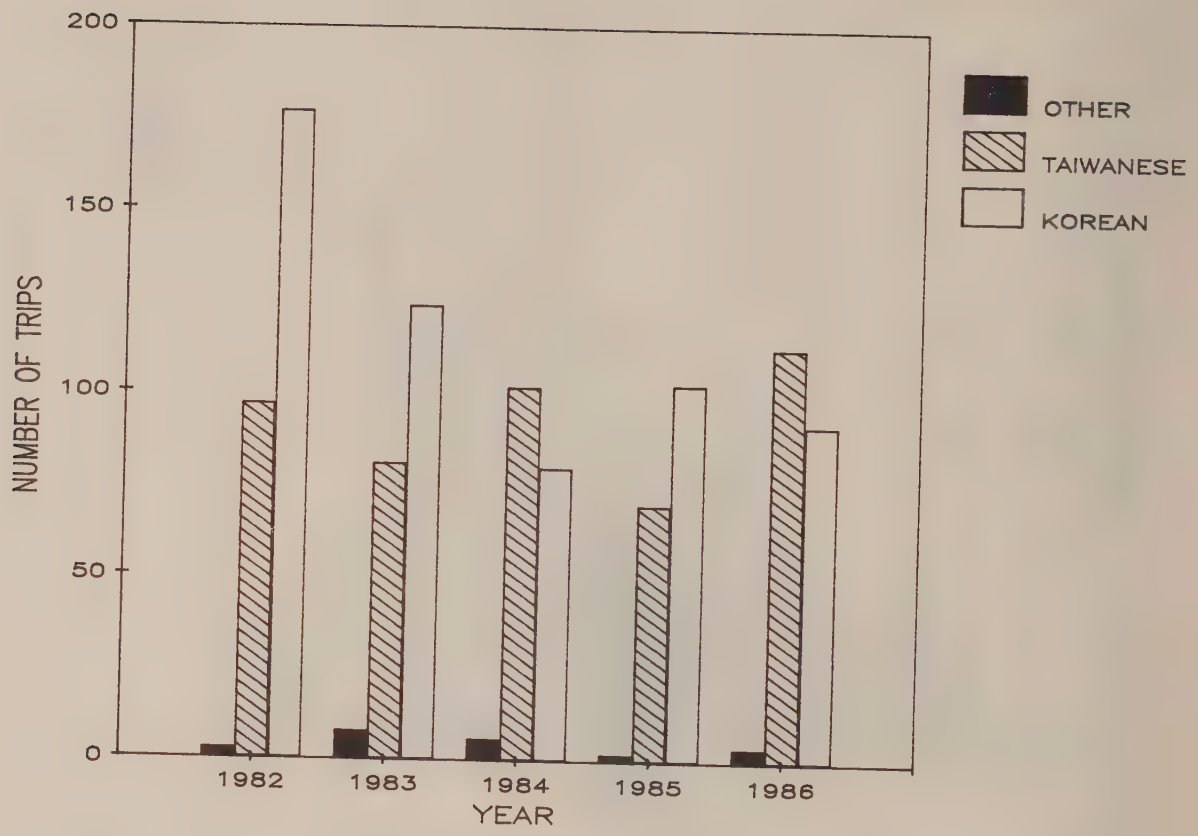

Figure 3.--Number of trips by nationality, 1982-86.

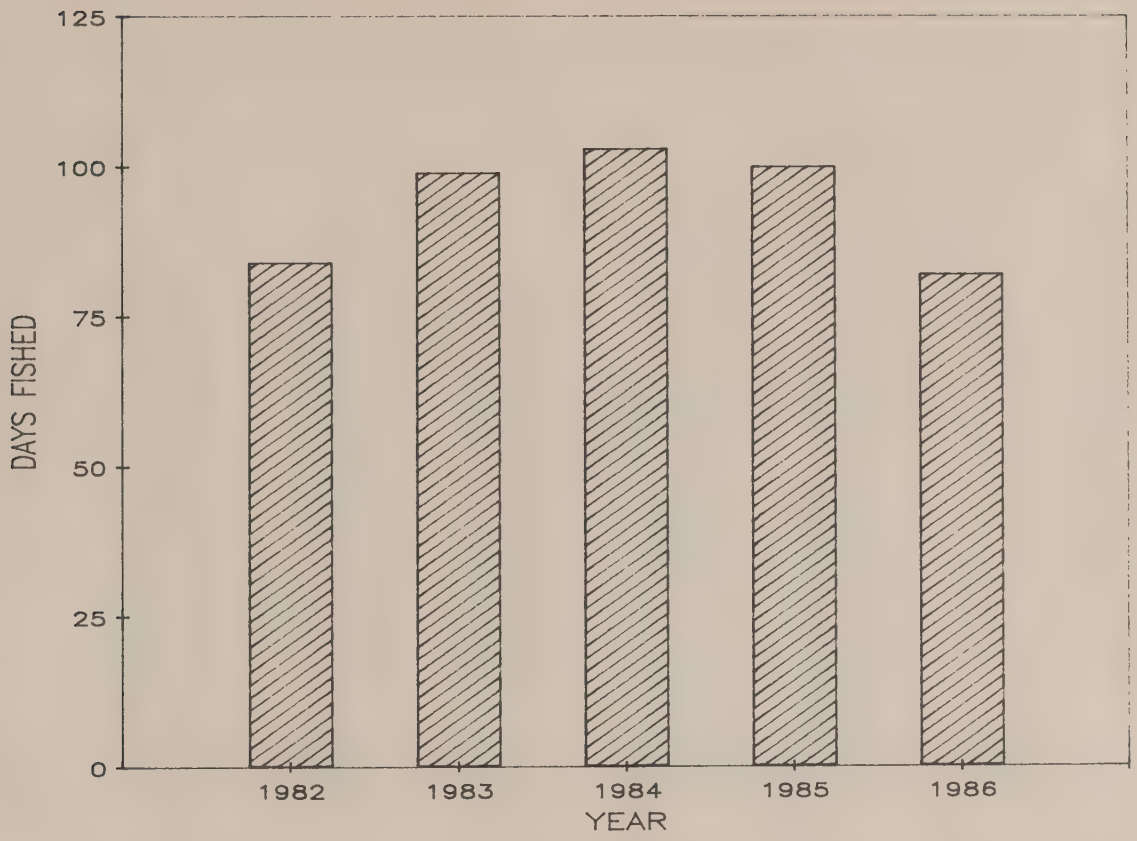

Figure 4.--Average number of days fished per trip, 1982-86.

Figure 5.--Number of hooks set by nationality, 1982-86.

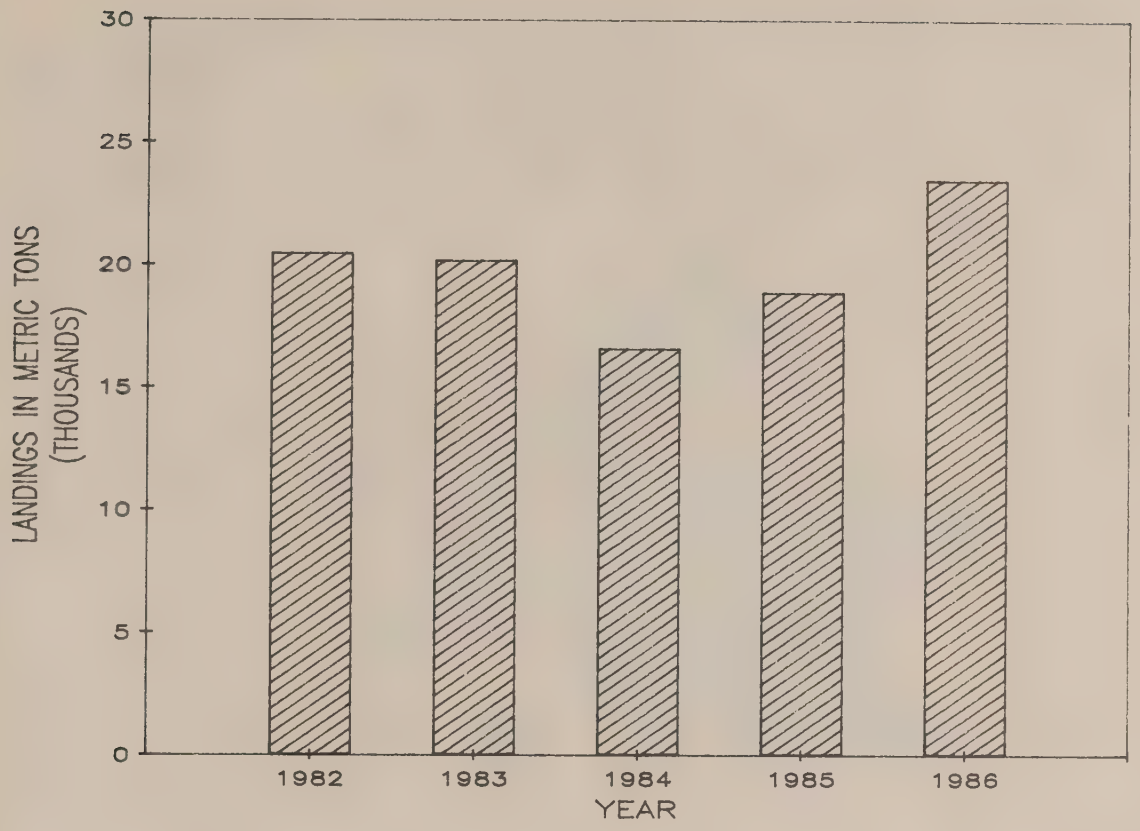

Figure 6.--Estimate of total landings, 1982-86.

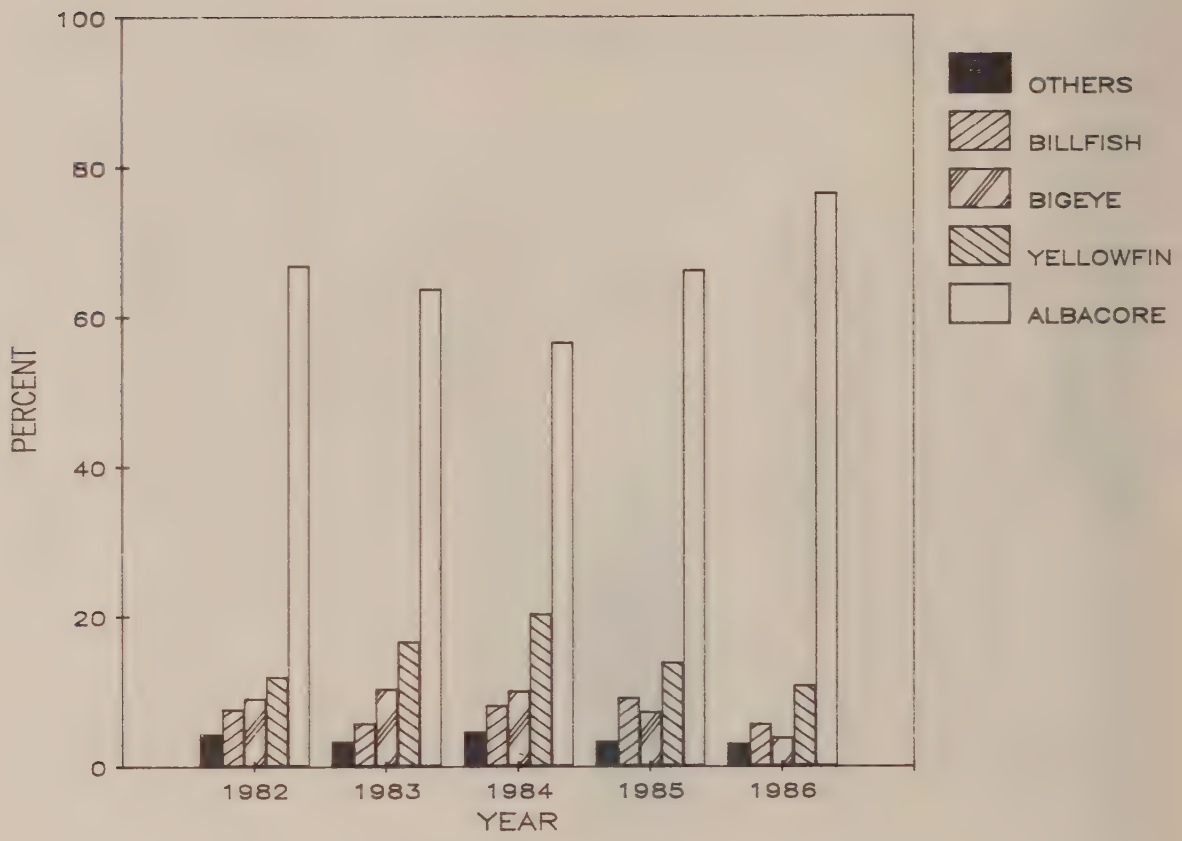

Figure 7.--Species composition of landings, 1982-86.

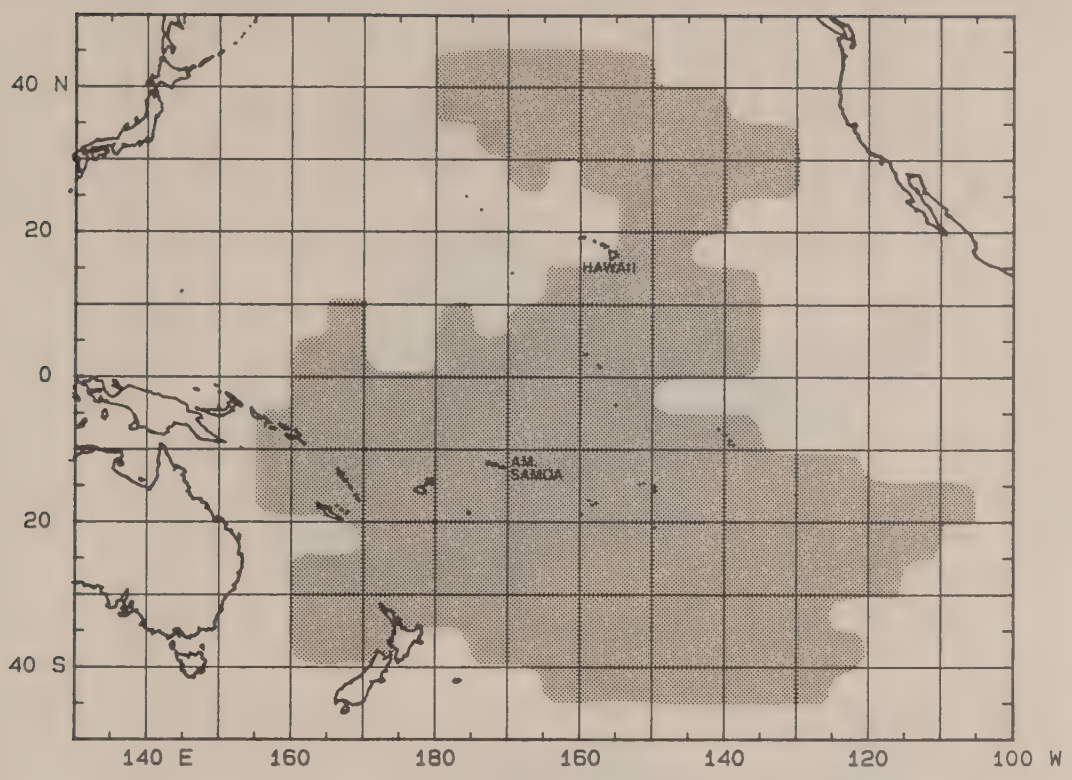

Figure 8.--Area fished by longliners operating out of American Samoa, 1982-86.

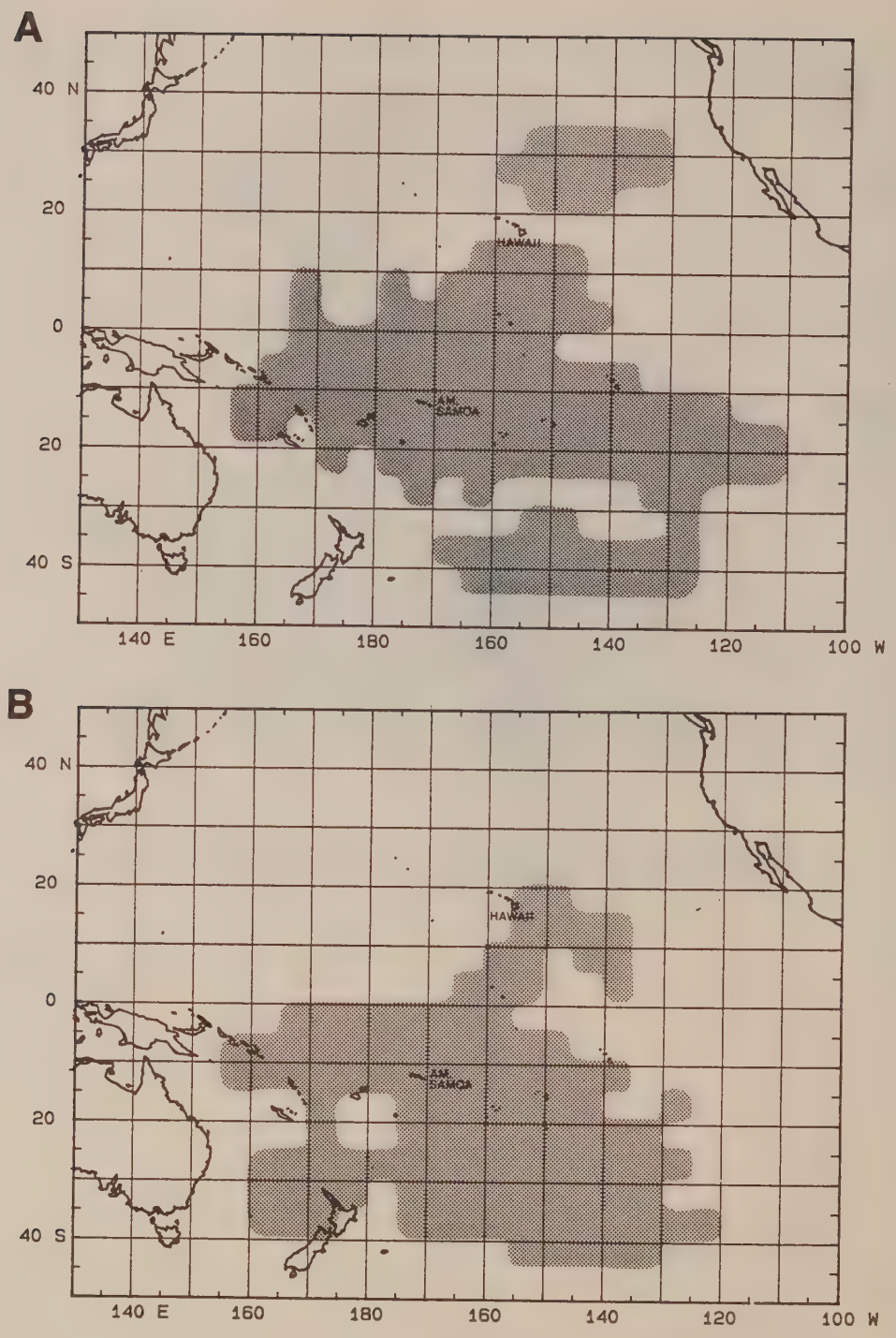

Figure 9.--Area fished by longliners operating out of American Samoa in (A) January-March, (B) April-June 1982-86.

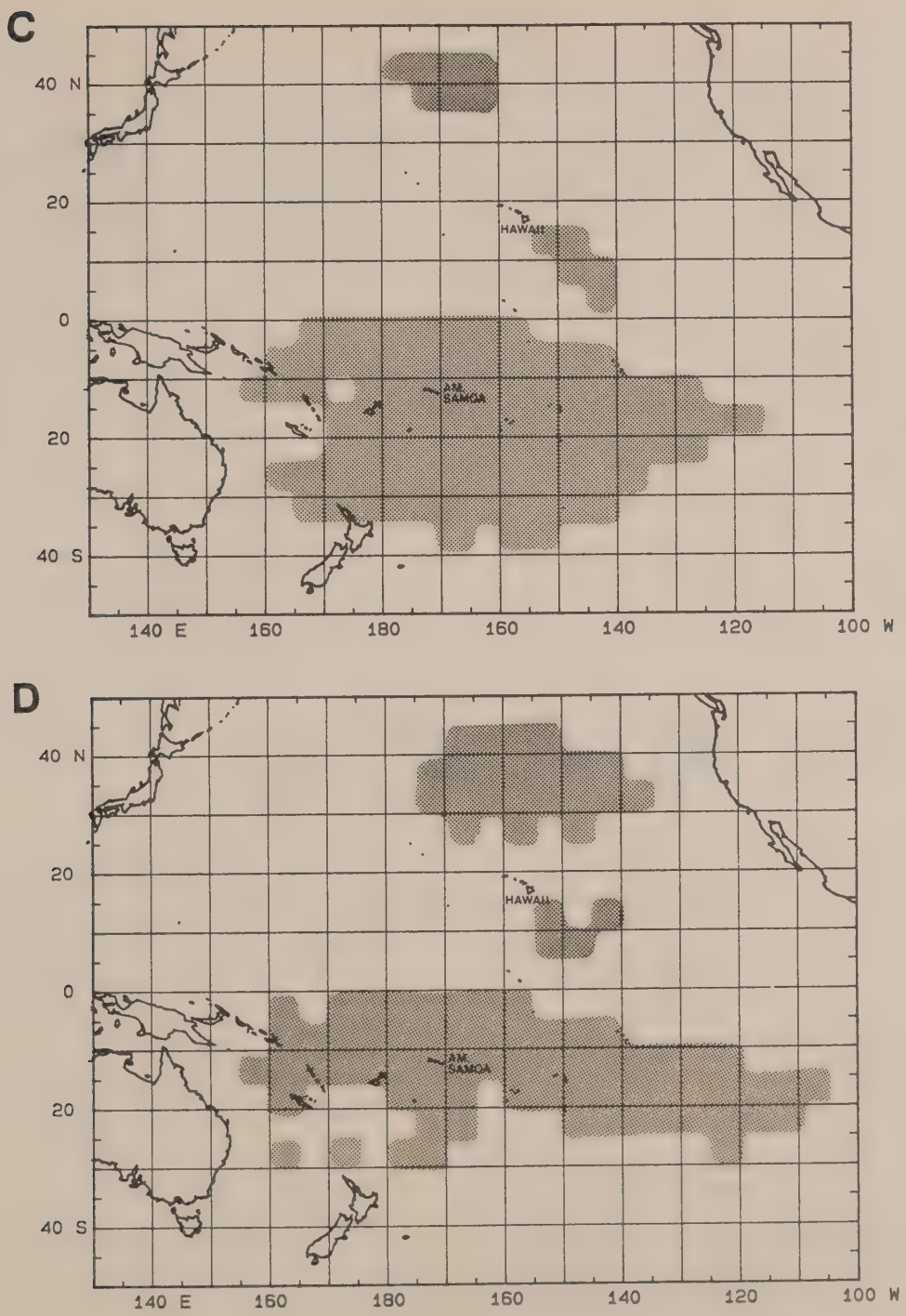

Figure 9.--Continued. (C) July-September, (D) October-December.

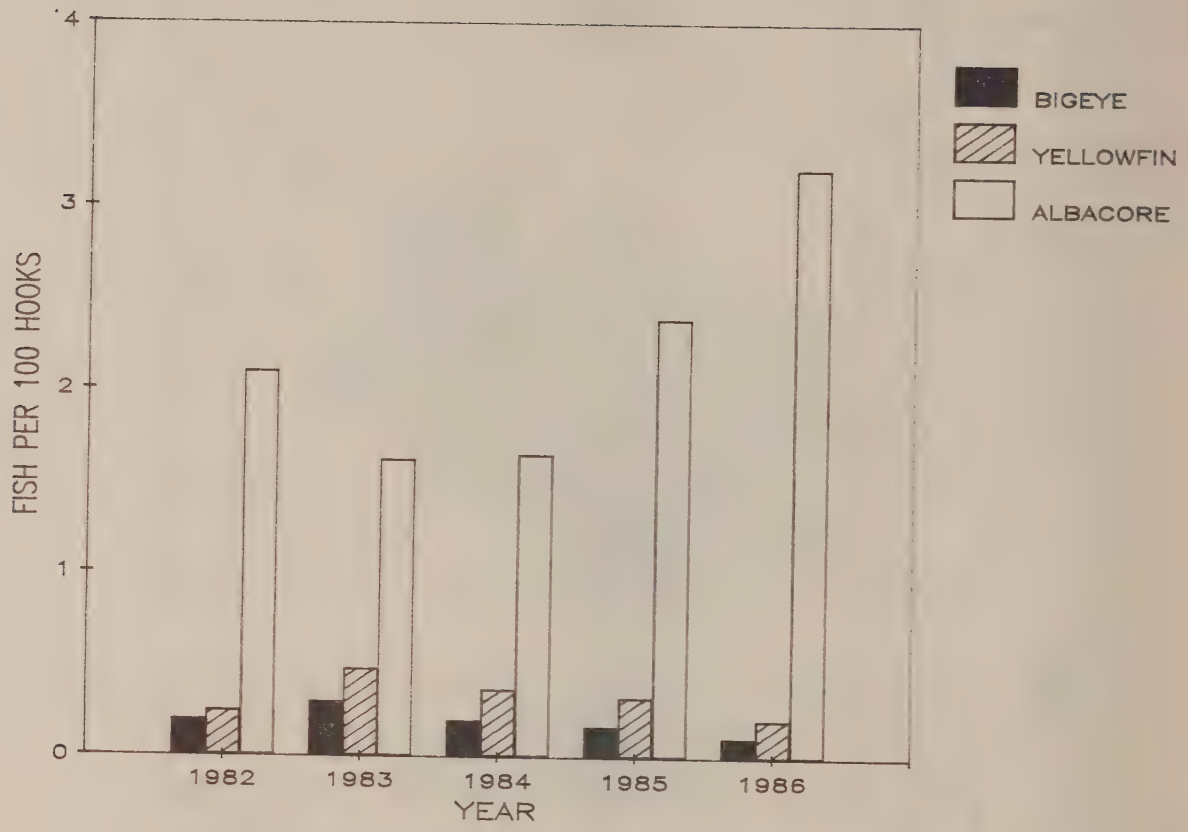

Figure 10.--Catch per 100 hooks, 1982-86.

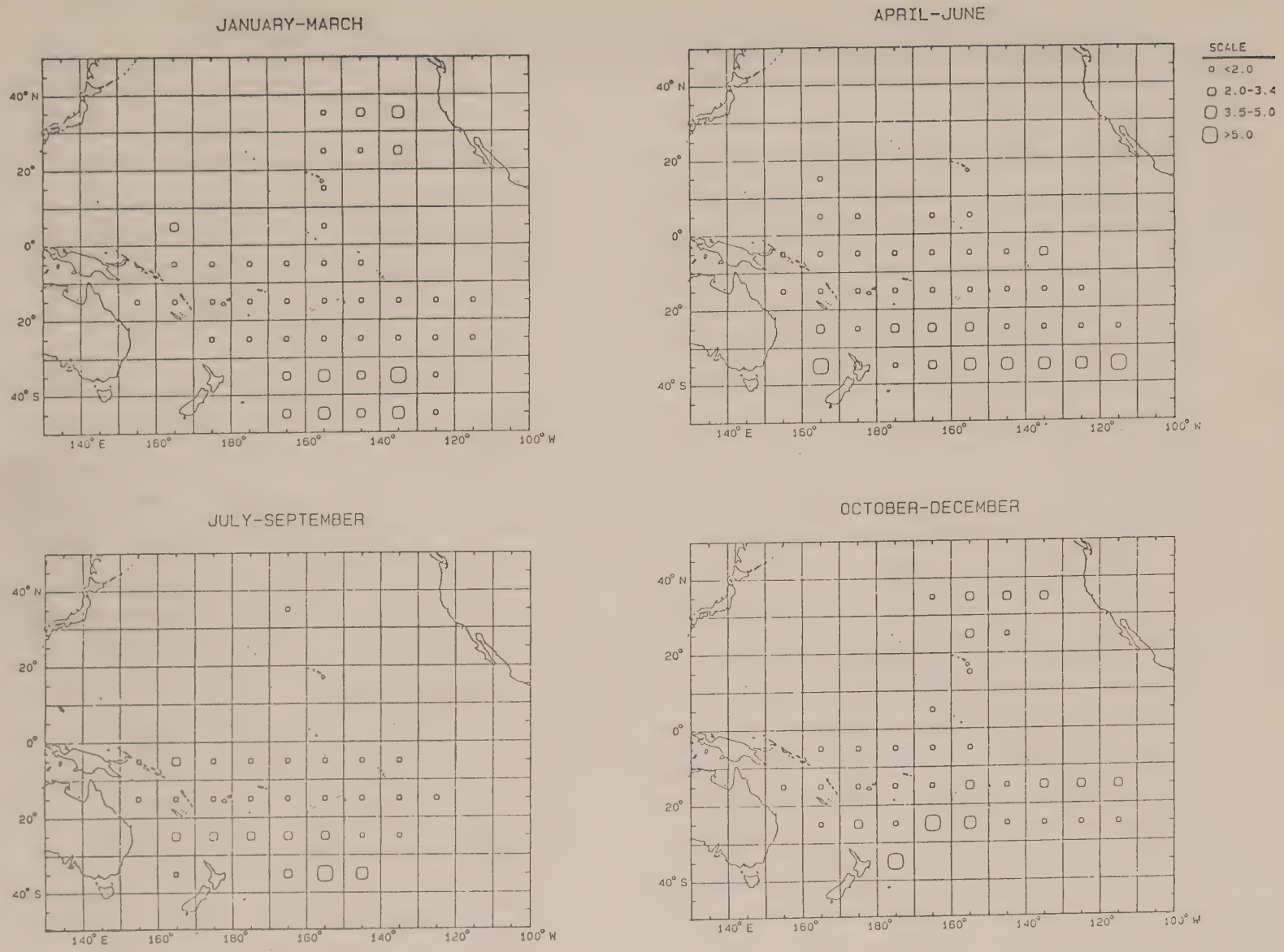

Figure 11.--Geographic distribution of albacore catch per unit effort in 3-month intervals, 1982. Catch symbols in a land-bordered 5° square do not necessarily reflect fishing effort within exclusive economic zones.

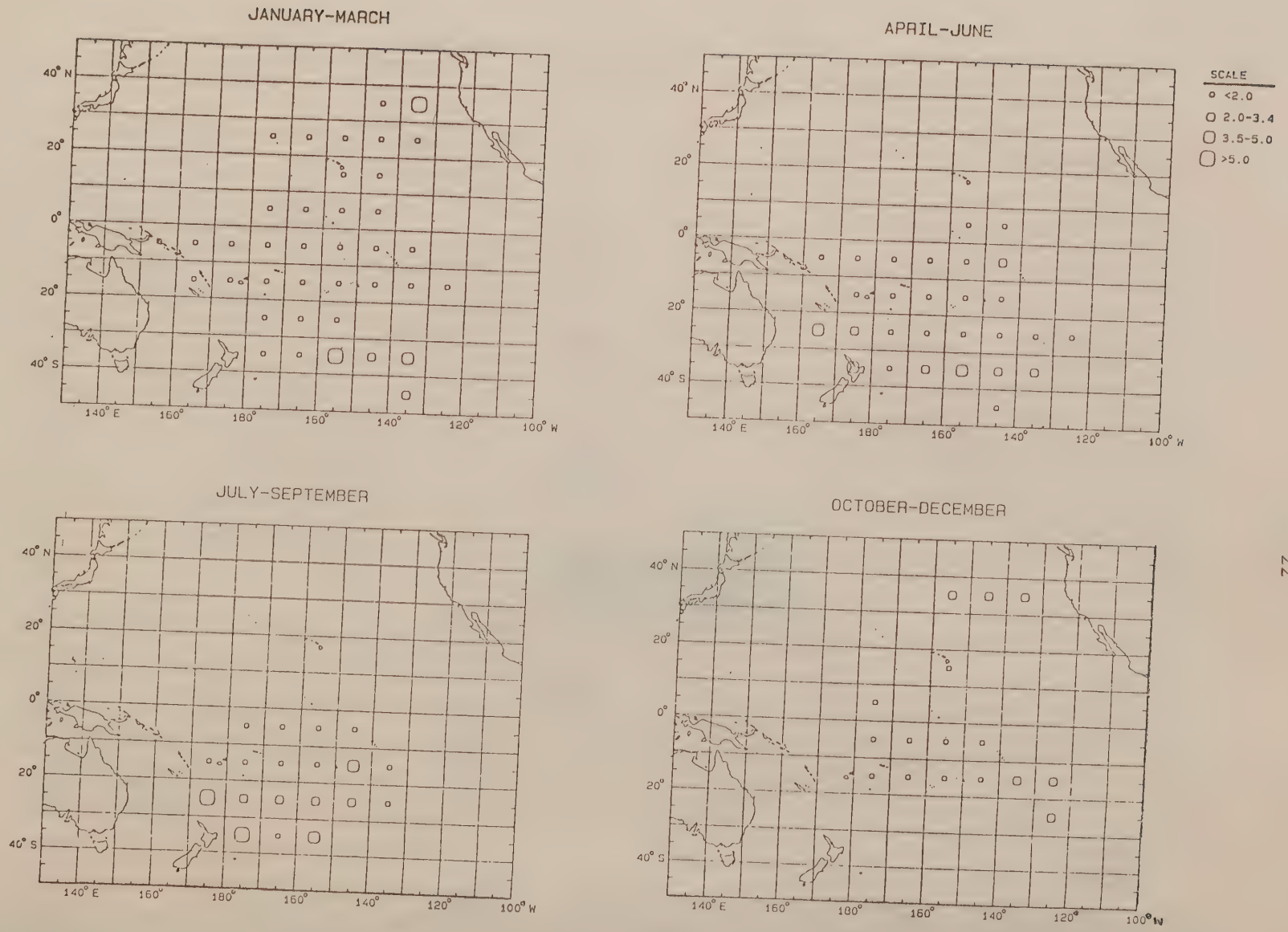

Figure 12.--Geographic distribution of albacore catch per unit effort in 3-month intervals, 1983. Catch symbols in a land-bordered 5° square do not necessarily reflect fishing effort within exclusive economic zones.

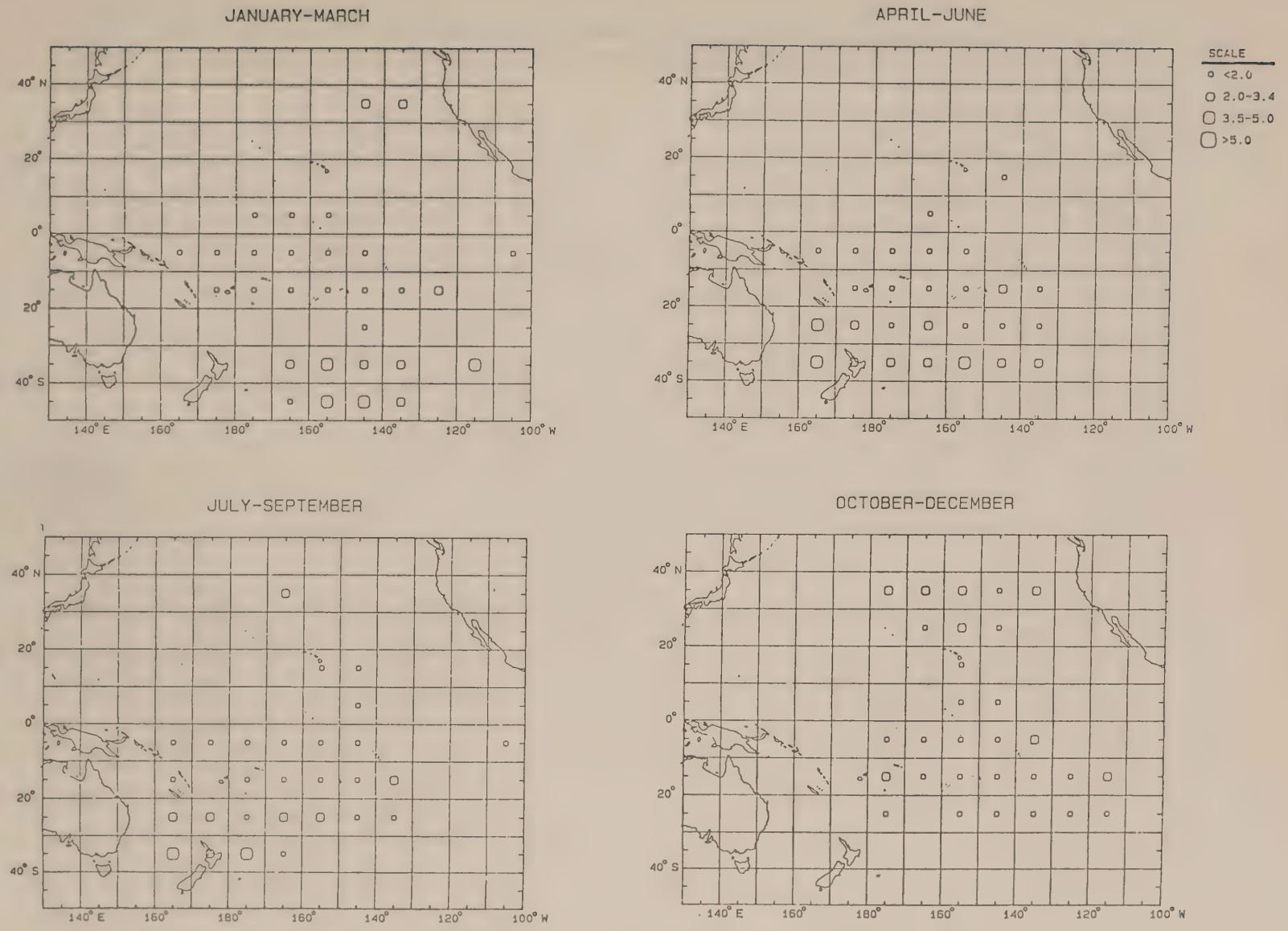

Figure 13.--Geographic distribution of albacore catch per unit effort in 3-month intervals, 1984. Catch symbols in a land-bordered 5° square do not necessarily reflect fishing effort within exclusive economic zones.

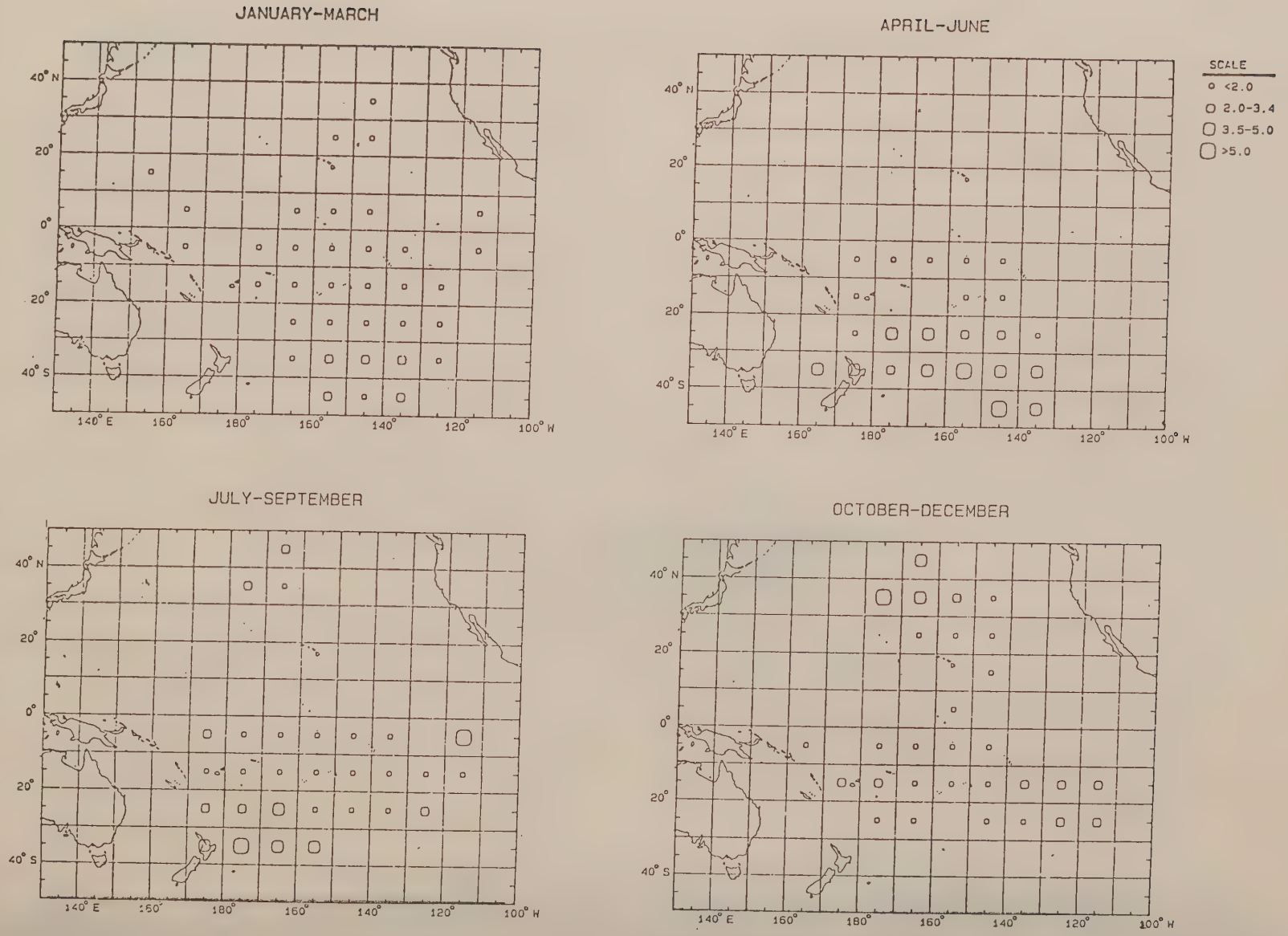

Figure 14.--Geographic distribution of albacore catch per unit effort in 3-month intervals, 1985. Catch symbols in a land-bordered 5° square do not necessarily reflect fishing effort within exclusive economic zones.

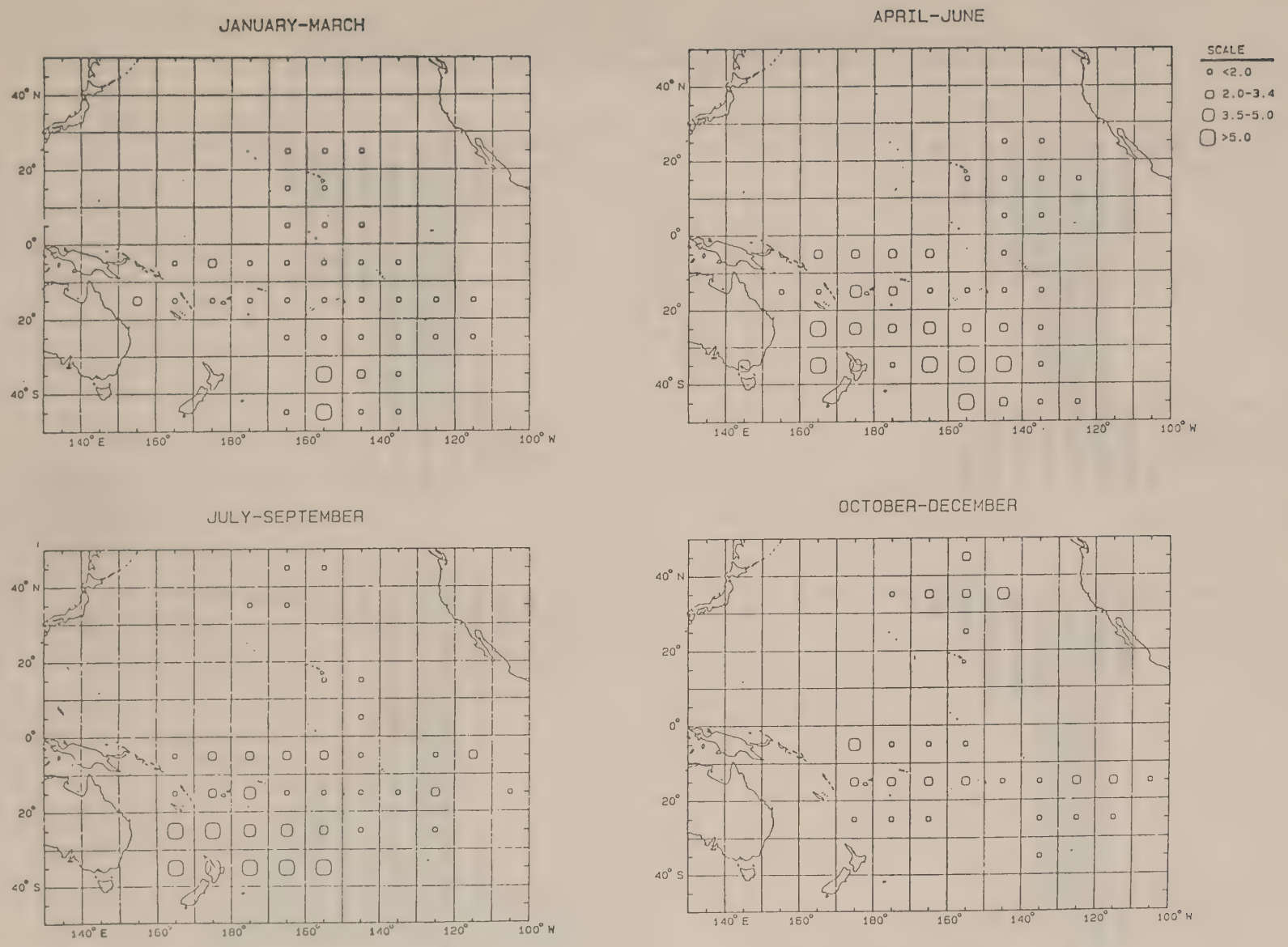

Figure 15.--Geographic distribution of albacore catch per unit effort in 3-month intervals, 1986. Catch symbols in a land-bordered 5° square do not necessarily reflect fishing effort within exclusive economic zones.

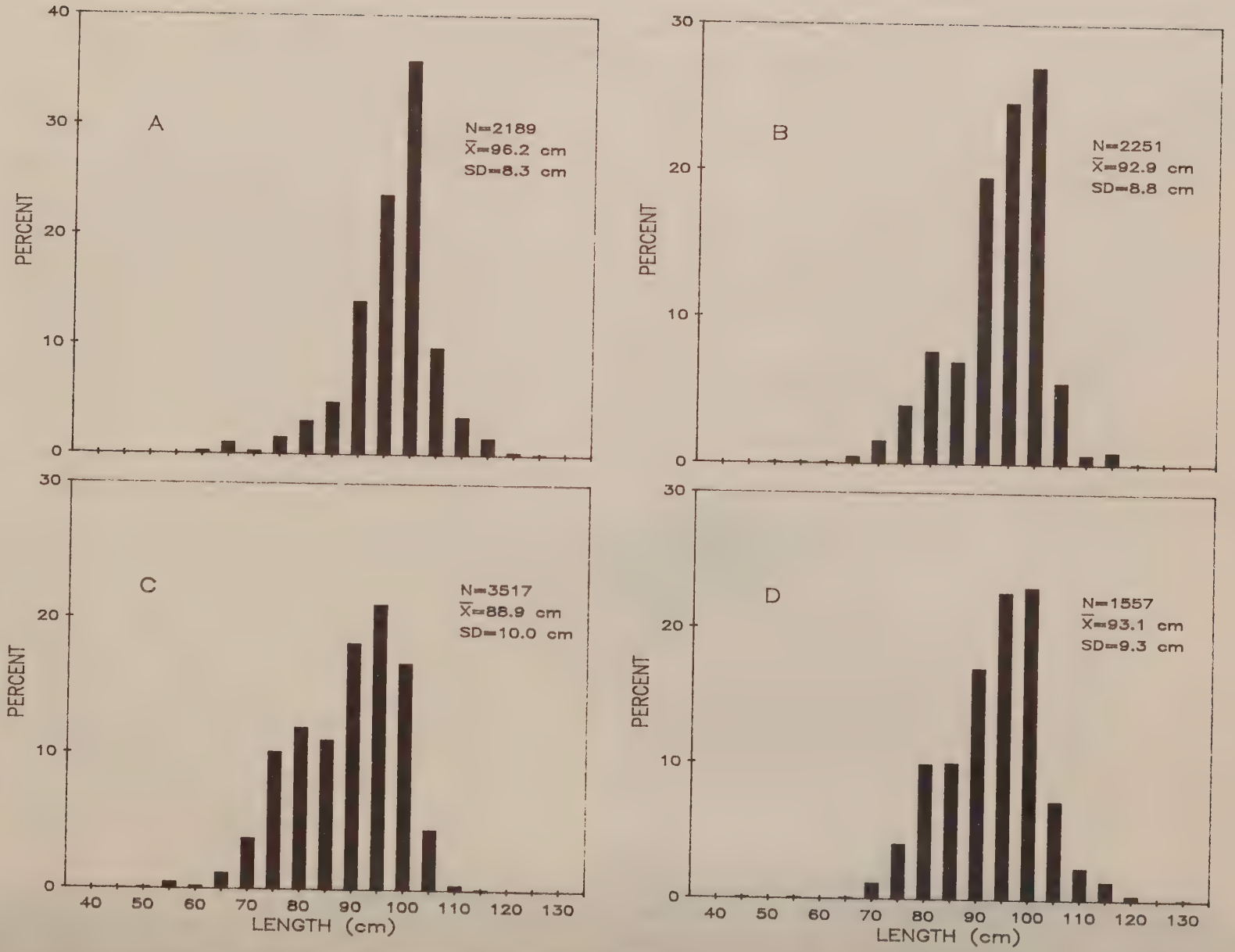

Figure 16.--Length-frequency of longline-caught albacore in (A) January-March, (B) April-June, (C) July-September, (D) October-December 1982.

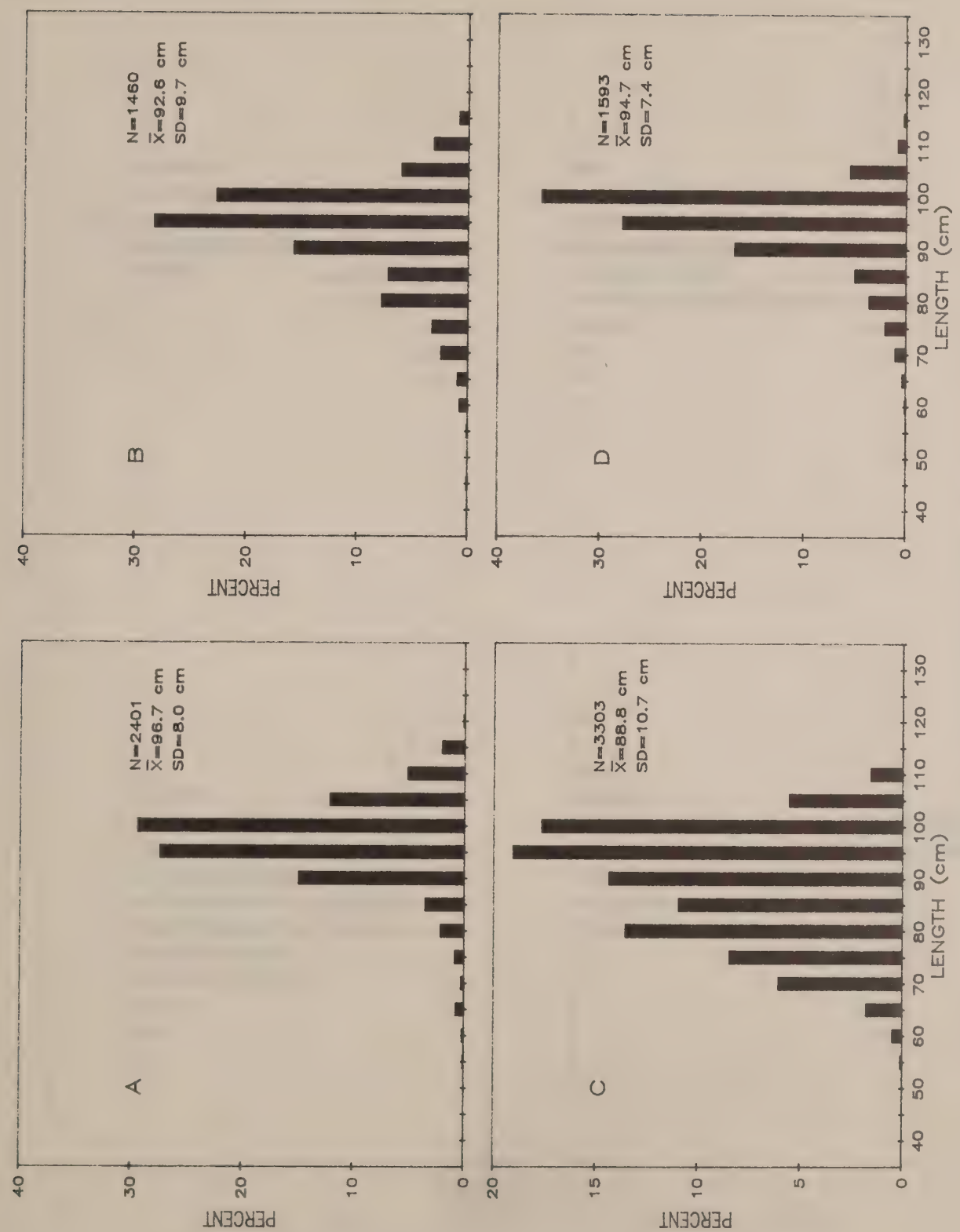

Figure 17.--Length-frequency of longline-caught albacore in (A) January-March, (B) April-June, (C) July-September, (D) October-December 1983.

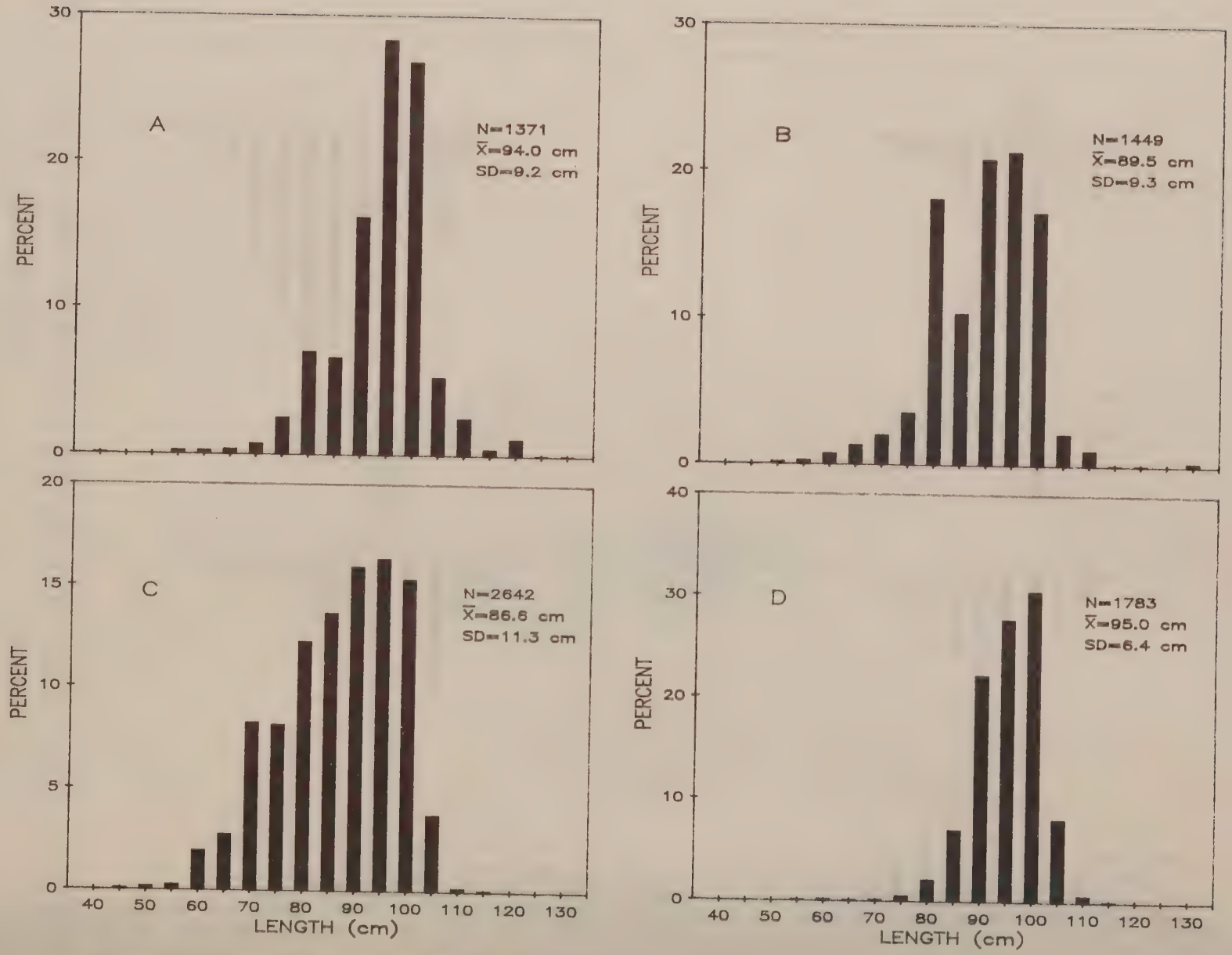

Figure 18.--Length-frequency of longline-caught albacore in (A) January-March, (B) April-June, (C) July-September, (D) October-December 1984.

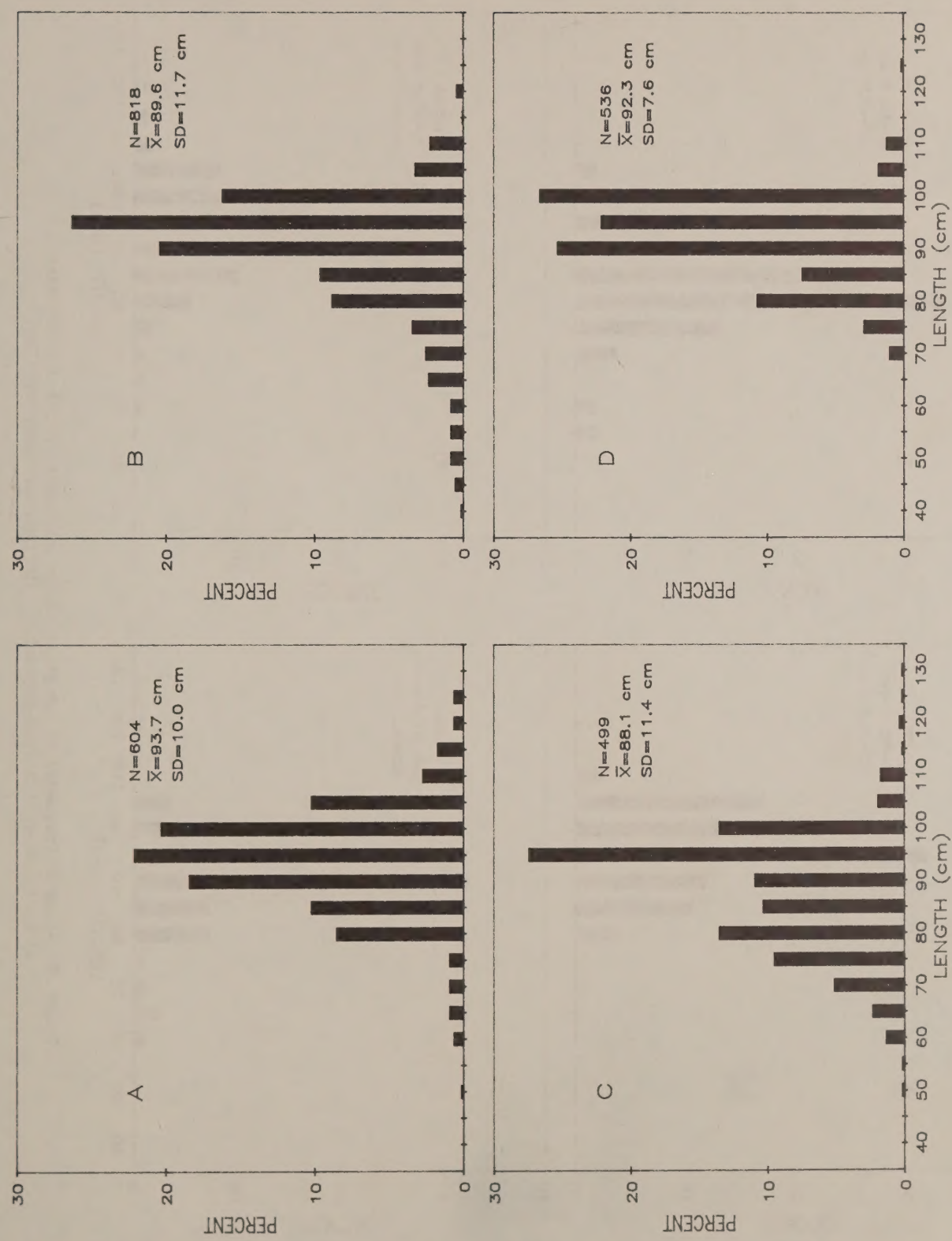

Figure 19.--Length-frequency of longline-caught albacore in (A) January-March, (B) April-June, (C) July-September, (D) October-December 1985.

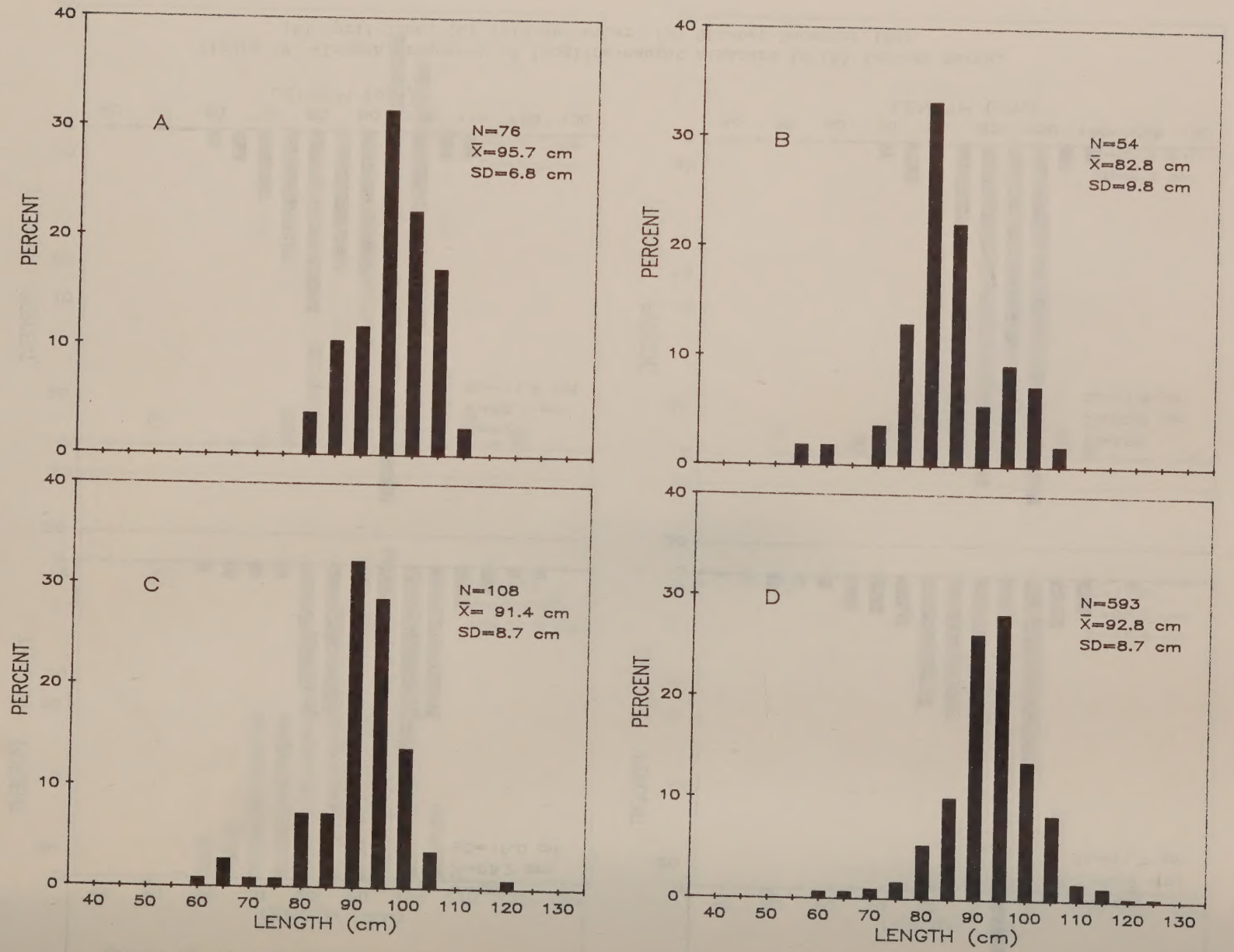

Figure 20.--Length-frequency of longline-caught albacore in (A) January-March, (B) April-June, (C) July-September, (D) October-December 1986.